UNITED STATES PATENT AND TRADEMARK OFFICE

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10/716,373	11/18/2003	Enrico Alessi	64659-00002USPX	4364

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GARDERE WYNNE SEWELL LLP	AKHAVANNIK, HADI
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL.**   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13-23 and 25-28* is/are rejected.

7)☒ Claim(s) *1,3,5,7,11-16,22-24 and 26-28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *18 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☒ All b)☐ Some * c)☐ None of:

    1.☒ Certified copies of the priority documents have been received.

    2.☐ Certified copies of the priority documents have been received in Application No. _____.

    3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date *2/14/05, 11/8/05*.

4) ☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1.   Claims 1, 3, 5, 7, 11, 12-16, 22-24, and 26-28 are objected to because of the

following informalities:

Independent claims 1 and 13 use the term marker in quotations. It is not clear

what purpose the quotations serve. The examiner believes it would be beneficial to

define the term marker instead of using quotations. Similar problems can be found in

claim 4.

Claim 3 states "using circular masks of different radios". The examiner believes

that the applicant intended to use "ratios" instead of radios. Also, the specification

makes no mention of "radios".

Regarding claim 16, the preamble of the claim incorrectly states "and intra-spot"

instead of "an intra-spot".

Claims 5, 7, 11, 12, 14-16, 22-24, 26-28 all attempt to clarify the terminology by

using parenthesis. The examiner believes the claims would read better if parentheses

were not used and instead the terms were defined in the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains.
Patentability shall not be negatived by the manner in which the invention was made.

2.   Claim 1-4, 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Siddiqui et al. (article titled "Mathematical Morphology applied to Spot Segmentation

and Quantification of Gene Microarray Images, referred to as "Siddiqui" herein) in view

of Bozinov et al. (article titled "Unsupervised technique for robust target separation and

analysis of DNA microarray sports through adaptive pixel clustering", referred to as

"Bozinov' herein).

Regarding claim 1, Siddiqui discloses a method of analysis of an array image

including one or more luminous spots on a background, comprising: determining a

shape and relative location of each spot on the array image (see the abstract, page 926

section titled introduction, and page 928 section titled spot segmentation of gene

microarray image. These sections disclose analyzing finding the location of spots in

DNA images);

generating a binary map of pixels defining a boundary of each spot on the

background (section III on page 928 disclose binarization of the image);

isolating each spot by an extraction operation using said binary map (section III

disclose segmenting the spots);

and for each spot, defining relative characteristic parameters and quality indexes

(section IV discloses quantification evaluation of the data);

wherein said binary map is generated with a technique of morphological filtering

comprising: filtering the array image with at least a morphological filter generating a

corresponding "marker" image of the background (section II discloses morphological filters for the binary image);

reconstructing said background by carrying out a reconstruction operation on said "marker" image to generate a corresponding reconstructed image of the background; and generating a filtered image of the luminosity of the background by performing a top-hat operation on said reconstructed background image and the array image; and performing a thresholding operation on said filtered image of the background luminosity (the last paragraph of section III discloses using a filter to remove noise. Section II discloses using a top hat operator to remove peaks).

Siddiqui does not explicitly disclose using clustering.

Bozinov discloses examining each spot by a segmentation operation to identify pixels belonging to a same cluster according to a preestablished criterion (pages 749-750 give an overview of the dna spot clustering method, which uses preestablished criterion);

It would have been obvious at the time of the invention to one of ordinary skill in the art to include in Siddiqui a clustering method as taught by Bozinov. The reason for the combination is because it makes for a more robust system that is able to group an array of dna spots based on their similarities. Further, both inventions are from the same field of endeavor of spot analysis.

Regarding claim 2, Siddiqui discloses that the reconstruction operation is carried out using circular masks (see pages 927-928 and page 929, section B as it discloses circularity).

Regarding claim 3, Siddiqui discloses filtering of the noise corrupting said binary map by: carrying out in succession two erosion operations using circular masks of different radios; carrying out a dilation operation using a circular mask of diameter larger than the maximum dimensions of the spot, generating a binary map filtered from noise; and using said binary map filtered from noise in said extraction operation (pages 927-928 disclose using morphological segmentation techniques to remove noise and segment the dna spots).

Regarding claim 4, Siddiqui and Bozinov disclose defining on a Cartesian reference frame spots present in the array image; carrying out in succession the following morphological filtering operations of said spots with directional openings having as structuring said segments of length not larger than the maximum dimension of the spots and oriented, respectively, along: the bisecting line of the first and third quadrant; the bisecting line of the second and fourth quadrant; the abscissa axis; and the ordinate axis; of said Cartesian reference frame generating spots on a corresponding "marker" image (section II discloses using directions opening and closing morphological operators. Figure 4 of Bosinov discloses using filters within a defined grid size)

Regarding claim 13, the rejection of claims 1-3 disclose all aspects of claim 13.

Regarding claim 14, Bosinov discloses having a spot extraction system for isolating luminous spots on a background of an array image, comprising: a scanning subsystem (Extractor) of the pixels of an image; a subsystem (Features Extractions, Clustering Conditions) of identification of elementary clusters composed of adjacent

pixels scanned in succession implementing the spot extraction operation; and a

subsystem (Clustering) of processing of said elementary clusters outputting clusters of

pixels (Cluster 1, . . . , Cluster N) present in the spot (pages 749-751 disclose these

basic clustering steps).

Regarding claim 15, Bozinov discloses thresholds and preestablsihed criteria that

is used for clustering the data.

Regarding claim 16, pages 749-750 of Bozinov discloses using multiple

clustering classes.

3.   Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Siddiqui

et al. (article titled "Mathematical Morphology applied to Spot Segmentation and

Quantification of Gene Microarray Images, referred to as "Siddiqui" herein) in view of

Bozinov et al. (article titled "Unsupervised technique for robust target separation and

analysis of DNA microarray sports through adaptive pixel clustering", referred to as

"Bozinov' herein) and in further view of Alessi et al. (article titled "A New Clustering

Based System For Automated Object Recogntion", referred to as "Alessi" herein).

Regarding claim 5, the rejection of claim 1 discloses all aspects of claim 5 except

for the specific clustering steps.

Alessi discloses these clustering steps in figure 2 and section titled "General

System Description".

It would have been obvious at the time of the invention to one of ordinary skill in

the art to combine in Siddiqui, Bozinov, and Gardes the specifics of the clustering as

taught by Alessi. The reason for the combination is because this is a standard

clustering sequence that many grouping algorithms use.

4.   Claim 6-10, 17-21, 23, and 25-28 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Siddiqui et al. (article titled "Mathematical Morphology applied to Spot

Segmentation and Quantification of Gene Microarray Images, referred to as "Siddiqui"

herein) in view of Bozinov et al. (article titled "Unsupervised technique for robust target

separation and analysis of DNA microarray sports through adaptive pixel clustering",

referred to as "Bozinov' herein) in further view of Gardes et al. (6901168, referred to as

"Gardes" herein).

        Regarding claim 6, the combination of Siddiqui and Bozinov disclose all aspects

of claim 6 except for the specifics of clustering based on grey level data.

        Gardes discloses wherein said preestablished criterion of segmentation

comprises calculating a characteristic value for pixels of a spot by a fuzzy logic

algorithm comprising: calculating for said spot the mean value of grey level of the

background pixels, said fuzzy logic algorithm using as antecedents: the grey level of a

pixel; the distance between said grey level of the pixels and the mean grey level of the

background pixels; and the square of said distance; and recognizing said pixels as

belonging to a same cluster if said characteristic value exceeds a preestablished

threshold (see column 8 lines 1-65 as it discloses finding the difference between the

grey levels for each cluster in order to establish proper inter-class variance thresholds).

It would have been obvious at the time of the invention to one of ordinary skill in the art to include in Siddiqui and Bozinov a grey level calculating and relationship finding means as taught by Gardes. The reason for the combination is because it allows the system to more accurately classify the items within each cluster.

Regarding claim 7, Gardes discloses defining by said preset criterion for each spot a first zone (True Signal) containing signal pixels and a second zone (false signal) containing background and/or noise pixels (Gardes does this by establishing a true signal with the least amount of variance and the false signal with greatest amount of variance as taught in column 8 lines 46-65).

Regarding claim 8 and 10, column 8 lines 51-65 of Gardes discloses clustering in multiple groups so as to minimize interclass variance.

Regarding claim 9, column 8 lines 7-51 discloses mean and variances for each group.

Regarding claim 17-21, please see the rejection of claim 6-9 as it discloses all aspects of claims 17-21.

Regarding claim 23, please see the rejection of claim 7 as it discloses all aspcts of claim 23.

Regarding claim 25, the rejection of claims 1-3 and 6 disclose all aspects of claim 25.

Regarding claim 26, the rejection of claim 6 discloses all aspects of claim 26.

Regarding claims 27-28, the rejection of claims 1 and 6 discloses that both Gardes and Bozinov disclose a fuzzy logic clustering system.

5.   Claims 11, 22, are rejected under 35 U.S.C. 103(a) as being unpatentable over

Siddiqui et al. (article titled "Mathematical Morphology applied to Spot Segmentation

and Quantification of Gene Microarray Images, referred to as "Siddiqui" herein) in view

of Bozinov et al. (article titled "Unsupervised technique for robust target separation and

analysis of DNA microarray sports through adaptive pixel clustering", referred to as

"Bozinov' herein) in view of Gardes et al. (6901168, referred to as "Gardes" herein) and

in further view of Alessi et al. (article titled "A New Clustering Based System For

Automated Object Recogntion", referred to as "Alessi" herein).

Regarding claim 11, the rejection of claim 6 discloses all aspects of claim 11

except for the specific clustering steps.

Alessi discloses these clustering steps in figure 2 and section titled "General

System Description".

It would have been obvious at the time of the invention to one of ordinary skill in

the art to combine in Siddiqui, Bozinov, and Gardes the specifics of the clustering as

taught by Alessi. The reason for the combination is because this is a standard

clustering sequence that many grouping algorithms use.

Regarding claim 22, the rejection of claim 11 above discloses all aspects of claim

22.

Allowable Subject Matter

6.   Claims 12 and 24 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Bartell (7130458, discloses a spot segmentation means), Yang et al. (article titled "Comparison of methods for image analysis on CDNA microarray" discloses the summary of the art for spot segmentation, Yang et al. (article titled "Analysis of cDNA microarray images" discloses a spot segmentation means).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hadi Akhavannik whose telephone number is 571-272-8622. The examiner can normally be reached on 10:30-7:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (571)272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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